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American Plaice Catch Results from Fall 2000 GEAC Survey in NAFO Subdivision 3Ps.

Résultats de captures de plie canadienne obtenus lors du relevé effectué par le GEAC à l'automne 2000 dans la sous-division 3Ps de l'OPANO.

John McClintock

AMEC
95 Bonaventure Avenue, P.O. Box 2035
St. John's, NF, A1C 5R6
john.mcclintock@amec.com

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Abstract

To enhance the fisheries research database in NAFO Division 3Ps, the Groundfish Enterprise Allocation Council (GEAC) has funded surveys each fall from 1997 to 2000 directed at cod and flatfish. The focus in this document is American plaice. The continuing intent is to create a series of annual fall surveys in 3Ps to complement current resource assessment activities carried out by the Department of Fisheries and Oceans (DFO). GEAC funded and performed the surveys with scientific guidance from DFO in the design and execution of a stratified random survey and the associated sampling. The data collected during these surveys have been subsequently analysed on behalf of GEAC and for the additional intent of providing this information to DFO, for their databases and their assessment work. This is the third GEAC survey to investigate in detail the American plaice catch following on the previous 1998-1999 surveys (CSAS Research Documents 99/59 and 2000/025). One trip to perform the 2000 survey was carried out from 4-15 December 2000. These dates correspond well with the late-November and December time periods for the earlier two years. During the trip, set details and length frequencies were logged in the DFO FFS system and otoliths were collected for subsequent aging. Catch statistics, length and age distribution, and stratified analysis estimates of American plaice abundance and biomass, including age distribution estimates, and interpretation of results are presented. The results of the 2000 survey appear to be generally consistent with those of 1999, in terms of abundance and the age and length population structure and overall distribution of the stock in 3Ps. Three to four-fold increases are observed in the 1991 to 1994 year classes, while estimates for the abundance of the 1990 and 1989 year classes are decreased two to three-fold from 1999. There are modest increases in 2000 from 1999 of 8% in the abundance estimate and 14% in the biomass estimate.

Résumé

Pour améliorer la base de données de recherche sur les pêches pour la sous-division 3Ps de l'OPANO, le Conseil des allocations aux entreprises d'exploitation du poisson de fond (GEAC) a financé des relevés de la morue et des poissons plats effectués chaque automne de 1997 à 2000. Le présent document porte sur la plie canadienne. Ces travaux ont pour but de créer une série de relevés annuels d'automne dans la sous-division 3Ps pour compléter les activités actuelles d'évaluation des ressources que mène le ministère des Pêches et des Océans (MPO). Le GEAC a financé et réalisé les relevés avec l'aide du MPO, qui a fourni des conseils scientifiques pour la conception et la réalisation d'un relevé aléatoire stratifié et des échantillonnages connexes. Les données ainsi recueillies ont été analysées pour le compte du GEAC et en vue de transmettre les résultats au MPO pour qu'il les entre dans ses bases de données et s'en serve dans ses travaux d'évaluation. Ce document aborde le troisième relevé du GEAC qui examine en détail les prises de plie canadienne, pour donner suite aux relevés de 1998 et de 1999 (documents de recherche 1999/059 et 2000/025 du SCES). Pour réaliser le relevé de 2000, une sortie a été effectuée du 4 au 15 décembre 2000, ce qui correspond bien aux périodes de sortie des deux années précédentes, soit la fin de novembre et décembre. Au cours de la sortie de 2000, les détails sur le mouillage des engins et les fréquences de longueurs ont été enregistrés dans le système FFS du MPO, et des otolithes ont été prélevés pour déterminer l'âge des poissons. Le document présente des statistiques de captures, la distribution des longueurs et des âges, des estimations par analyse stratifiée de l'abondance et de la biomasse, notamment des estimations de la distribution par âge, ainsi que l'interprétation des résultats. Les résultats du relevé 2000 concordent généralement avec ceux de 1999 en ce qui concerne l'abondance, les structures d'âge et de longueur de la population et la répartition générale du stock dans 3Ps. Par rapport au relevé de 1999, les classes d'âge de 1991 à 1994 ont augmenté de trois à quatre fois, tandis que les abondances des classes d'âge de 1989 et de 1990 sont de deux à trois fois plus basses. En 2000, l'abondance totale a augmenté de 8 % et la biomasse, de 14 %, par rapport à 1999.

Introduction

To enhance the fisheries research database in NAFO Division 3Ps, the Groundfish Enterprise Allocation Council (GEAC) has funded surveys each fall from 1997 to 2000 directed at cod and flatfish. The continuing intent is to create a series of annual fall surveys in 3Ps to complement current resource assessment activities carried out by the Department of Fisheries and Oceans (DFO). GEAC funded and performed the surveys with scientific guidance from DFO in the design and execution of a stratified random survey and the associated sampling. The data collected during these surveys have been subsequently analysed on behalf of GEAC and for the additional intent of providing this information to DFO, for their databases and their assessment work. This is the fourth such GEAC survey in 3Ps following on the 1997 to 1999 surveys and the third survey in which the American plaice catches have been investigated in detail (following on CSAS Research Document 99/59 [1] and 2000/025 [2]). Interest in this survey was directed at cod, American plaice, and witch flounder (grey sole). One trip to perform the 2000 survey was carried out from 4-15 December 2000. These dates correspond well with the late-November and December time periods for the earlier three years. During the trip, set details and length frequencies were logged in the DFO FFS system and otoliths were collected for subsequent aging.

Under contract to GEAC, AMEC has taken the data logged using the DFO FFS system, combined with the aged otiliths, created digital data files appropriate for inclusion in the DFO (VAX computer system) databases, and performed a first analysis of the survey results. This document presents these results.

Methods and Materials

A Stratified Random survey was carried out in 3Ps by the *M.V. Pennysmart*. A summary of the trip is presented below.

Trip 5: Stratified Random Survey
Trip 5 was carried out from 4 to 15 December 2000. This time period is consistent with the 1997-1999 stratified random survey sets. The *Pennysmart*, the same boat as in the previous surveys and with the same captain, sailed from Marystown for operation in 3Ps, St. Pierre Bank, Halibut Channel, and Green Bank. Figure 1 shows a map illustrating the location of the strata surveyed. The survey was directed at cod, American plaice, and witch flounder. Set details, length, sex, and otolith information were sampled. Approximately five days of survey time was lost due to poor weather and sea conditions. This had the impact of limiting the number of sets performed to 75, approximately 10 to 20 fewer than in the previous three years.

Tows of duration 30 minutes using an Engels 96 high lift trawl with a 135 mm diamond mesh cod end (not lined) were conducted. The trawl was fitted with rock

hopper foot gear and Bergen #7 trawl doors. The 30 minute tows were commenced once the net reached the bottom.

Performance of the trawl was checked onboard using SCANMAR sensors: bridge display of doorspread and net opening (headline height) was visually monitored and these measurements together with trawl depth were noted every five minutes on the written bridge log for each set. The doorspread, opening, and clearance measurements were logged to computer disk using Seatrawl software. The trawl gear and configuration were identical to those used in the 1997-1999 surveys.

A total of 73 successful stratified random tow sets were completed. Two sets (#s 12 and 33) were unsuccessful: the net belly was torn and subsequently mended.

Data were logged using FFS with the length and otolith sampling carried out on board. The resulting ages were input to create an age and growth digital file.

Results and Discussion

Shore-based Analysis

The set details and plaice length frequencies were exported from FFS to create ASCII data files. The age and growth data were keyed in following completion of the otolith aging by Thomas Collier. The sole focus in the work presented here is for plaice.

The plaice were sampled in 1 cm length groupings and all ratio/percentages of catch measured were applied.

ACON plots of the spatial distribution of catch weights are presented in Figure 2 and include the corresponding catch results from the 1998 and 1999 surveys. 2000 shows the greatest catch concentrations at the southern entrance to the Halibut Channel, generally similar to 1999.

Table 1 presents a summary of the plaice set details and catch numbers and weights. The mean plaice catch for the 73 stratified random sets is 53 fish and a mean catch weight of 37 kg. These numbers are almost identical to those from the 1999 survey (mean values of 55 fish and 36 kg). A catch of plaice was reported in 52 of the 73 successful sets. The largest catch of 948 plaice and weight 532 kg was from set 41 at the southeast entrance to the Halibut Channel at a depth of approximately 135 m. A similarly large set 40 with catch 925 plaice and weight 488 kg was caught immediately adjacent to set 41 just to the southeast also in stratum area 319. A total of seven sets had catches over 100 kg, four sets with catches over 300 kg. The mean plaice weight for all sets was 0.7 kg per plaice (compared with 0.65 kg for 1999). The median plaice weight of the 52 sets in which plaice were caught was 0.8 kg (0.6 kg in 1999). The mean plaice weight for the largest catch set 41 was 0.56 kg.

Gear Performance

The survey gear performance was monitored with SCANMAR units mounted on the net for doors, opening, and clearance measurement (Figure 3). The variability in the measurements is higher than is desirable and the net performance should be carefully monitored in the future. For the reported sets, doorspread exhibited a range of values from just under 40 m to just over 90 m. The mean doorspread values for 2000 are comparable to those measured with a NETMIND system used in 1999. The mean doorspread in 2000 was 72 m compared with 74 m in 1999. Net opening exhibits a mean of 5.4 m. The mean clearance was 0.6 m. While no wingspread sensor was present on the net for 2000, the vessel and gear are the same as previous years and there is nothing apparent in the 2000 SCANMAR measurements to suggest a drastic change in performance. Nevertheless, a more detailed comparison of net performance and mensuration should be undertaken in the future. For the present though, the assumption is made here to use the same 60 ft wingspread value for the stratified analysis that has also been used for the other years. This is appropriate for preserving the four year relative index of abundance.

Length and Age

Figure 4 presents the sampled length composition of the 2000 survey and, for comparison, results from the 1998 and 1999 surveys are also shown. For 2000, the fish sampled range in size from 17 cm up to 74 cm. The distribution shows a peak at 37 cm just below the mean of 40 cm. The distributions for all three years are similar with the exceptions that the magnitude of the peaks are greater in 1999 and 2000 that in 1998 and that the peak in 2000 is shifted slightly to the left and is not quite as broad as that in 1999.

Figures 5a and 5b present age composition of the 2000 sampled plaice. Figure 5a presents length versus age distribution. The mean age of 521 sampled plaice was 9.5 years. The youngest and oldest fish were 3 and 18 years. The mode was 9 years.

Figure 5b presents a bar chart of the sampled numbers of plaice at age for 1998 to 2000. The number of sampled plaice are virtually the same for the three years: 515 in 1998; 542 in 1999, and 521 in 2000. Similar to 1999, the 2000 distribution shows ages 7 through 10 as the most frequent accounting for roughly 14-18% of the total sample set. The age distributions for the three years are similar. Ages 8, 9, 10, 13, and 14 show similar totals with the age 9 totals in 1999 and 2000 being slightly greater than 1998 and the age 10, 11, and 12 totals in 1998 being slightly larger than those for 1999 and 2000. The age 6 and 7 totals for 1999 and 2000 are roughly 50-100% increased from those from 1998.

Stratified Analysis

Stratified Random surveys analysis was carried out using the DFO stratified analysis STRAP software and applying the French Exclusion Zone around St. Pierre et Miquelon for area calculations. A wingspread of 60 feet was used.

Table 2a presents the STRAP output of estimated abundance and biomass. The estimated total number of plaice for 3Ps is 47.6 million (with 95% confidence limits of 11.2 and 84.1 million). The mean number of plaice per standard 1.5 nautical mile tow is 57.3 (with limits of 13.5 and 101.0) compared with 53 in Table 1. The estimated total plaice biomass is 32.7 ktonnes. The mean catch weight per tow is 39.3 kg consistent with the Table 1 value of 37.

Table 2b presents a summary comparison of abundance and biomass STRAP estimates for 1998 to 2000. Estimates for 2000 are essentially consistent with 1999 with very minor increase in the numbers. The 2000 abundance results are up very slightly by 7% from 1999. The biomass estimates are up slightly by 14%. The mean number of fish per set and mean catch weight per set values for 2000 show the same small increases from 1999.

Table 3a presents the STRAP age composition of numbers per tow, with sexes combined. The total mean number per tow is 52.8. The greatest numbers expected are at ages 9 (14.2 fish per tow), 8 (11.4 fish), 10 (8.8 fish) and 7 (6.5 fish). Lesser numbers of fish at ages 11, 12, 13, and 6 are also expected.

Table 3b presents an age summary comparison of abundance STRAP estimates for 1998 to 2000. The 2000 values are those from Table 3a. Similar to 1999, a large range of ages are evident for 2000. The 2000 survey indicates increased numbers compared with 1999 for ages 6 to 8 and 12 to 15. By contrast, ages 9 to 11 are down about 20 to 25%; however, still generally well-represented.

Tables 4a and 4b present the plaice abundance and biomass estimates by strata for all three survey years, arranged by depth regime. Most of the catches, for all years, are in the three depth regimes <30, 31-50, and 51-100 fathoms. Values are generally similar between 1999 and 2000 with slight increases in 2000 for the <30 and 31-50 fathom regimes and a slight decrease in totals for the four deeper regimes. There are no dramatic changes from 1999 to 2000. The largest catches continue to be from strata 319 and 315.

Figure 6 presents the STRAP-estimated mean number of fish per tow. As already witnessed all estimates are greatly increased in 1999 and 2000 from 1998. 2000 and 1999 portray a generally consistent picture with the 2000 survey indicating increased numbers expected for ages 7 and 8 (up approximately 75% and 23% from 1999) and decreased numbers expected for ages 9 and 10 (down approximately 22% and 35% from 1999).

Figure 7 presents the estimated age composition by year class. These are the same numbers as Figure 6, presented by year class as opposed to age. In 2000, the strongest year classes are 1991, 1992, 1990, and 1993. In 1999, the strongest year classes are 1990, 1989, and 1991. In 1998, the strongest year classes were 1988, 1989, 1986, 1987, and 1990. The 2000 survey indicates increased numbers compared with 1999 for year classes 1994 to 1991 (up by a factor of one half to six

times) and decreased numbers compared with 1999 for year classes 1990, 1989, and 1988 (down by a factor of 35% to just over three times). From 2000 the more recent years classes since 1991 are up, and the year classes 1990 and before are down. Other than these main differences between 1999 and 2000 the two distributions are generally the same.

Figure 8 presents the STRAP-estimated abundance at length values for all sexes combined for the three survey years. Consistent with the sampled length distribution of Figure 4, the estimated length distributions appear about the same from 1999 to 2000, with slightly increased numbers in 2000 for fish over 48 cm and slightly decreased numbers in 2000 for fish in the 37 to 48 cm range.

In summary, the results of the 2000 survey appear to be generally consistent with those of 1999, in terms of abundance and the age and length population structure and overall distribution of the stock in 3Ps. Three to four-fold increases are observed in the 1991 to 1994 year classes, while estimates for the abundance of the 1990 and 1989 year classes are decreased two to three-fold from 1999. There are modest increases in 2000 from 1999 of 8% in the abundance estimate and 14% in the biomass estimate.

References

[1] McClintock, J., 1999. "American Plaice and Witch Flounder Catch Results from Surveys in NAFO Division 3Ps." CSAS Research Document 99/59."

[2] McClintock, J., 2000. "American Plaice Catch Results from Fall 1999 Survey in NAFO Division 3Ps." CSAS Research Document 2000/025."

Table 1 Summary of American Plaice Catches for Stratified Random Survey Sets, NAFO Division 3Ps, 4-15 Dec 2000.

M.V. Pennysmart Vessel	Trip	Set	Year	Month	Day	StrLin	Division	Unit Area	Set Location Lat (N)	Set Location Long (W)	Plaice Catch # of Fish	Plaice Catch Weight (kg)	Set Duration (min)	Tow Distance (n.mi.)	Plaice Mean Weight (kg)
49	5	1	0	12	4	322	3P	M29	46.56	55.71	0	0	30	1.5	
49	5	2	0	12	4	322	3P	M29	46.52	55.59	5	1	30	1.5	0.2
49	5	3	0	12	5	322	3P	M30	46.47	55.64	0	0	30	1.5	
49	5	4	0	12	5	322	3P	M30	46.44	55.87	9	2.5	30	1.5	0.3
49	5	5	0	12	5	322	3P	L30	46.40	56.07	6	3	30	1.5	0.5
49	5	6	0	12	5	314	3P	L30	46.29	56.46	3	2.5	30	1.5	0.8
49	5	7	0	12	5	314	3P	L30	46.12	56.42	2	2.5	30	1.5	1.3
49	5	8	0	12	5	320	3P	L30	46.08	56.67	2	2	30	1.5	1.0
49	5	9	0	12	5	314	3P	L30	46.12	56.70	2	2.5	30	1.5	1.3
49	5	10	0	12	5	314	3P	L30	46.25	56.65	302	318.4	30	1.5	1.1
49	5	11	0	12	5	314	3P	L29	46.62	56.93	0	0	30	1.6	
49	5	13	0	12	5	311	3P	K29	46.83	57.15	39	30	30	1.5	0.8
49	5	14	0	12	6	310	3P	K29	46.88	57.13	19	9	30	1.5	0.5
49	5	15	0	12	6	310	3P	K29	46.85	57.29	12	6.5	30	1.5	0.5
49	5	16	0	12	6	313	3P	K29	46.70	57.38	6	3	30	1.5	0.5
49	5	17	0	12	6	312	3P	K29	46.63	57.31	1	1	30	1.5	1.0
49	5	18	0	12	6	713	3P	J29	46.56	58.72	1	1	30	1.5	1.0
49	5	19	0	12	6	713	3P	K30	46.45	57.69	0	0	30	1.4	
49	5	20	0	12	6	713	3P	J30	46.33	58.04	0	0	30	1.4	
49	5	21	0	12	6	713	3P	K30	46.26	57.70	0	0	30	1.5	
49	5	22	0	12	6	311	3P	K30	46.44	57.35	20	9	30	1.5	0.5
49	5	23	0	12	6	313	3P	K30	46.39	57.37	12	7	30	1.5	0.6
49	5	24	0	12	7	312	3P	K30	46.33	57.22	3	4	30	1.5	1.3
49	5	25	0	12	7	705	3P	K30	46.25	57.34	9	14	30	1.4	1.6
49	5	26	0	12	7	705	3P	K30	46.21	57.38	1	1.5	30	1.4	1.5
49	5	27	0	12	7	713	3P	K30	46.09	57.47	1	2	30	1.5	2.0
49	5	28	0	12	7	712	3P	K31	45.85	57.54	0	0	30	1.5	
49	5	29	0	12	7	712	3P	K31	45.74	57.46	0	0	30	1.5	
49	5	30	0	12	7	712	3P	K31	45.73	57.11	0	0	30	1.5	
49	5	31	0	12	7	706	3P	L31	45.87	56.96	7	10	30	1.5	1.4
49	5	32	0	12	7	316	3P	L31	45.72	56.72	14	13	30	1.5	0.9
49	5	34	0	12	7	320	3P	L31	45.86	56.55	7	9	30	1.5	1.3
49	5	35	0	12	8	706	3P	L31	45.56	56.64	8	14	30	1.5	1.8
49	5	36	0	12	8	706	3P	L31	45.51	56.65	1	1	30	1.6	1.0
49	5	37	0	12	8	320	3P	L32	45.38	56.05	33	24	30	1.5	0.7
49	5	38	0	12	8	320	3P	M31	45.51	55.93	3	3	30	1.5	1.0
49	5	39	0	12	9	318	3P	N32	45.09	54.60	0	0	30	1.5	
49	5	40	0	12	9	319	3P	N32	45.11	54.87	925	488	30	1.5	0.5
49	5	41	0	12	9	319	3P	N32	45.15	55.00	948	531.96	30	1.6	0.6
49	5	42	0	12	9	319	3P	M32	45.25	55.19	80	59	30	1.6	0.7
49	5	43	0	12	9	319	3P	M32	45.32	55.37	229	130	30	1.4	0.6
49	5	44	0	12	9	319	3P	M32	45.18	55.38	77	60.42	30	1.4	0.8
49	5	45	0	12	11	318	3P	M32	45.08	55.44	0	0	30	1.6	
49	5	46	0	12	11	707	3P	M33	44.99	55.31	0	0	30	1.4	
49	5	47	0	12	11	708	3P	M33	44.95	55.51	2	2	30	1.5	1.0
49	5	48	0	12	11	708	3P	M33	44.89	55.62	2	1	30	1.6	0.5
49	5	49	0	12	11	707	3P	M33	44.89	55.68	2	0.6	30	1.5	0.3
49	5	50	0	12	11	317	3P	M32	45.01	55.99	51	44.5	30	1.5	0.9
49	5	51	0	12	12	317	3P	L33	44.97	56.06	169	142	30	1.5	0.8
49	5	52	0	12	12	316	3P	L33	44.98	56.14	4	5	30	1.5	1.3
49	5	53	0	12	12	315	3P	L32	45.12	56.05	25	17.5	30	1.5	0.7
49	5	54	0	12	12	315	3P	M32	45.10	55.88	98	79	30	1.5	0.8
49	5	55	0	12	12	315	3P	M32	45.19	55.77	184	135	30	1.5	0.7
49	5	56	0	12	12	315	3P	M32	45.37	55.62	483	468.91	30	1.6	1.0
49	5	57	0	12	12	320	3P	M31	45.60	55.80	9	13	30	1.5	1.4
49	5	58	0	12	12	320	3P	M31	45.61	55.65	6	10.5	30	1.5	1.8
49	5	59	0	12	13	321	3P	M30	46.15	55.88	0	0	30	1.4	
49	5	60	0	12	13	321	3P	M30	46.10	55.75	14	8	30	1.5	0.6
49	5	61	0	12	14	323	3P	L31	45.83	56.38	9	4	30	1.6	0.4
49	5	62	0	12	14	323	3P	M31	45.65	55.07	10	4	30	1.5	0.4
49	5	63	0	12	14	325	3P	N31	45.63	54.77	0	0	30	1.6	
49	5	64	0	12	14	326	3P	N31	45.60	54.42	0	0	30	1.6	
49	5	65	0	12	14	326	3P	N31	45.63	54.42	0	0	30	1.6	
49	5	66	0	12	14	325	3P	N31	45.75	54.70	0	0	30	1.5	
49	5	67	0	12	14	325	3P	N31	45.78	54.90	0	0	30	1.5	
49	5	68	0	12	14	325	3P	N31	45.92	54.77	1	0.4	30	1.5	0.4
49	5	69	0	12	14	323	3P	M30	46.09	55.28	10	3	30	1.6	0.3
49	5	70	0	12	14	324	3P	N30	46.23	54.87	8	1.5	30	1.6	0.2
49	5	71	0	12	14	324	3P	N30	46.47	54.61	1	0.14	30	1.6	0.1
49	5	72	0	12	15	322	3P	M30	46.27	55.35	3	1	30	1.5	0.3
49	5	73	0	12	15	321	3P	M30	46.22	55.77	0	0	30	1.5	
49	5	74	0	12	15	321	3P	M30	46.09	55.50	0	0	30	1.5	
49	5	75	0	12	15	321	3P	M31	45.99	55.63	0	0	30	1.6	
								Minimum			0.0	0.0	30.0	1.4	0.1
								Maximum			948.00	531.96	30.00	1.60	2.00
								Mean			53.12	37.09	30.00	1.51	0.83
								Median			3.00	2.50	30.00	1.50	0.78
								Standard Error			2.29	1.46	0.00	0.00	0.01
								Total			3878.00	2707.83	2190.00	110.20	43.39
								Count			73	73	73	73	73

Table 2a Stratified Analysis Estimated Plaice Abundance and Biomass

PLAICE GEAC 3PS 2000 No Zone NUMBERS

STRATUM	NO.SETS	TOTAL	AV./SET	UNITS	TOTAL NO	VAR.
310	2	31.00	15.50	9255.	143459.	24.50
311	2	59.00	29.50	17903.	528133.	180.50
312	2	4.00	2.00	16281.	32563.	2.00
313	2	18.00	9.00	11147.	100323.	18.00
314	5	309.00	61.80	61748.	3816015.	18031.20
315	4	759.81	189.95	52357.	9945428.	34931.80
316	2	18.00	9.00	11147.	100323.	50.00
317	2	220.00	110.00	11620.	1278193.	6962.00
318	2	0.00	0.00	8715.	0.	0.00
319	5	2216.61	443.32	66477.	29470614.	183865.89
320	6	60.00	10.00	79988.	799884.	133.60
321	5	14.00	2.80	73503.	205808.	39.20
322	6	23.00	3.83	94648.	362819.	12.57
323	3	27.81	9.27	47020.	435917.	0.62
324	2	8.44	4.22	33374.	140795.	21.53
325	4	1.00	0.25	63775.	15944.	0.25
326	2	0.00	0.00	11215.	0.	0.00
705	2	10.71	5.36	13174.	70574.	36.73
706	3	15.94	5.31	28509.	151456.	14.61
707	2	2.00	1.00	4999.	4999.	2.00
708	2	3.88	1.94	8512.	16493.	0.01
712	3	0.00	0.00	49385.	0.	0.00
713	5	2.00	0.40	57492.	22997.	0.30

	TOTAL			AVERAGE	
TOTAL	UPPER	LOWER	MEAN	UPPER	LOWER
47642736.	84075904.	11209572.	57.25	101.02	13.47

EFFECTIVE DEGREES OF FREEDOM= 5 STUDENTS T-VALUE= 2.57 ALPHA=0.05

WEIGHTS

STRATUM	NO.SETS	TOTAL	AV./SET	UNITS	TOTAL NO	VAR.
310	2	15.50	7.75	9255.	71729.	3.13
311	2	39.00	19.50	17903.	349105.	220.50
312	2	5.00	2.50	16281.	40704.	4.50
313	2	10.00	5.00	11147.	55735.	8.00
314	5	325.90	65.18	61748.	4024722.	20038.79
315	4	671.10	167.78	52357.	8784283.	35142.77
316	2	18.00	9.00	11147.	100323.	32.00
317	2	186.50	93.25	11620.	1083559.	4753.13
318	2	0.00	0.00	8715.	0.	0.00
319	5	1246.05	249.21	66477.	16566650.	50745.63
320	6	61.50	10.25	79988.	819881.	63.78
321	5	9.00	1.80	73503.	132305.	16.20
322	6	7.50	1.25	94648.	118311.	1.58
323	3	10.56	3.52	47020.	165550.	0.39
324	2	1.54	0.77	33374.	25656.	0.81
325	4	0.40	0.10	63775.	6377.	0.04
326	2	0.00	0.00	11215.	0.	0.00
705	2	16.61	8.30	13174.	109389.	89.68
706	3	24.94	8.31	28509.	236984.	44.79
707	2	0.60	0.30	4999.	1500.	0.18
708	2	2.94	1.47	8512.	12502.	0.56
712	3	0.00	0.00	49385.	0.	0.00
713	5	3.00	0.60	57492.	34495.	0.80

	TOTAL			AVERAGE	
TOTAL	UPPER	LOWER	MEAN	UPPER	LOWER
32739762.	53556580.	11922946.	39.34	64.35	14.33

EFFECTIVE DEGREES OF FREEDOM= 9 STUDENTS T-VALUE= 2.26 ALPHA=0.05

Table 2b Stratified Analysis Estimated Plaice Abundance and Biomass: Comparison for 1998-2000

3Ps Plaice Estimates						
"numbers"abundance (millions of fish)						
	95% upper limit	Estimated	95% lower limit	95% upper limit	Mean #fish /tow	95% lower limit
1998	17.4	12.7	8.0	20.9	15.3	9.6
1999	85.4	44.1	2.7	102.6	52.9	3.3
2000	84.1	47.6	11.2	101.0	57.3	13.5
"weights" biomass (ktonnes)						
	95% upper limit	estimated	95% lower limit	95% upper limit	Mean catch /tow (kg)	95% lower limit
1998	13.9	9.2	4.5	16.7	11.1	5.4
1999 *	57.8	28.7	-	69.4	34.5	-
2000	53.6	32.7	11.9	64.4	39.3	14.3
* Note: variance too large for valid lower limits for 1999						

Table 3a Stratified Analysis Plaice Age Composition, Numbers per Standard Tow

PLAICE GEAC 2000 3PS No Zone (S1 BY AGE)

AGE COMPOSITION-NUMBERS PER STANDARD TOW

SUMMARY TABLE SPECIES:SPECIES 0889 SEX:COMBINED

AGE IN YEARS	TOTAL NUMBERS	UPPER LIMIT	LOWER LIMIT	MEAN PER TOW	UPPER LIMIT	LOWER LIMIT	D.F.
0.0	0.	0.	0.	0.00	0.00	0.00	0
0.0	0.	0.	0.	0.00	0.00	0.00	0
1.0	0.	0.	0.	0.00	0.00	0.00	0
2.0	0.	0.	0.	0.00	0.00	0.00	0
3.0	15673.	83106.	-51760.	0.02	0.10	-0.06	2
4.0	14384.	32497.	-3729.	0.02	0.04	0.00	6
5.0	93893.	151024.	36761.	0.11	0.18	0.04	9
6.0	1339225.	2618956.	59494.	1.61	3.15	0.07	4
7.0	5424296.	11199277.	-350685.	6.52	13.46	-0.42	4
8.0	9477812.	19487958.	-532332.	11.39	23.42	-0.64	4
9.0	11854130.	22902972.	805289.	14.24	27.52	0.97	4
10.0	7342944.	12663727.	2022161.	8.82	15.22	2.43	6
11.0	3187576.	5790312.	584840.	3.83	6.96	0.70	5
12.0	2711623.	5582729.	-159483.	3.26	6.71	-0.19	3
13.0	1388923.	2875781.	-97935.	1.67	3.46	-0.12	4
14.0	489062.	854684.	123439.	0.59	1.03	0.15	5
15.0	372174.	578960.	165388.	0.45	0.70	0.20	7
16.0	53424.	89883.	16966.	0.06	0.11	0.02	9
17.0	65504.	133158.	-2150.	0.08	0.16	0.00	6
18.0	41420.	110184.	-27345.	0.05	0.13	-0.03	5
UNKNOWN	36156.	104095.	-31783.	0.04	0.13	-0.04	5
TOTAL	43908220.	79066968.	8749473.	52.76	95.00	10.51	5

ESTIMATION TYPE:STANDARD TRANSFORMATION TYPE:NONE
CONFIDENCE LEVEL: 0.95%
****-ONE OR MORE OF THE LOWER LIMITS IN THE ABOVE
TABLE IS LESS THAN OR EQUAL TO ZERO. VARIANCE IS TOO LARGE FOR
VALID CONFIDENCE LIMITS ****

Table 3b Stratified Analysis Estimated Plaice Abundance at Age Distribution: Comparison for 1998-2000

	3Ps Plaice Estimates					
	"number" abundance (millions of fish)			Mean #fish/tow		
Age (years)	1998	1999	2000	1998	1999	2000
5	0.10	0.23	0.09	0.12	0.27	0.11
6	0.26	1.23	1.34	0.31	1.48	1.61
7	0.60	3.09	5.42	0.72	3.72	6.52
8	1.62	7.67	9.48	1.94	9.21	11.39
9	2.11	14.52	11.85	2.53	17.45	14.24
10	2.77	9.96	7.34	3.33	11.97	8.82
11	1.64	3.68	3.19	1.97	4.43	3.83
12	1.73	2.20	2.71	2.08	2.64	3.26
13	0.91	0.89	1.39	1.09	1.07	1.67
14	0.40	0.43	0.49	0.49	0.52	0.59
15	0.31	0.07	0.37	0.37	0.08	0.45

Table 4a Plaice abundance estimates (thousands of fish)
from GEAC surveys in NAFO Division 3Ps from 1998-2000

Depth range (fathoms)	Strata	Vessel Trip #Sets Mean Date sq. mi.	Pennysmart 3 86 6-Dec 1998	Pennysmart 4 90 27-Nov 1999	Pennysmart 5 73 10-Dec 2000
<30	314	974	198	190	3816
	320	1320	3020	1147	800
		Subtotal	3218	1337	4616
31-50	312	272	147	779	33
	315	827	2838	5015	9945
	321	1189	210	2034	206
	325	944	53	144	16
	326	166	0	37	0
		Subtotal	3248	8009	10200
51-100	311	317	63	2202	528
	317	193	1482	1349	1278
	319	984	1947	28370	29471
	322	1567	414	740	363
	323	696	263	906	436
	324	494	11	67	141
		Subtotal	4180	33634	32217
101-150	310	170	440	148	143
	313	165	418	72	100
	316	189	50	153	100
	318	129	84	17	0
		Subtotal	992	390	343
151-200	705	195	224	198	71
	706	476	475	295	151
	707	74	117	19	5
		Subtotal	816	512	227
201-300	708	126	21	4	16
	712	731	16	85	0
	713	851	211	89	23
		Subtotal	248	178	39
	Total [1]		12,702	44,060	47,642

[1] Totals are for all strata fished. Individual strata totals rounded to nearest 1000.

Table 4b Plaice biomass estimates (t)
from GEAC surveys in NAFO Division 3Ps from 1998-2000

Depth range (fathoms)	Strata	Vessel Trip #Sets Mean Date sq. mi.	Pennysmart 3 86 6-Dec 1998	Pennysmart 4 90 27-Nov 1999	Pennysmart 5 73 10-Dec 2000
<30	314	974	116	238	4025
	320	1320	3030	997	820
		Subtotal	3146	1235	4845
31-50	312	272	163	603	41
	315	827	1671	3652	8784
	321	1189	176	1198	132
	325	944	41	84	6
	326	166	0	14	0
		Subtotal	2051	5551	8963
51-100	311	317	43	1016	349
	317	193	1076	824	1084
	319	984	940	18769	16567
	322	1567	131	202	118
	323	696	67	268	166
	324	494	11	27	26
		Subtotal	2268	21106	18310
101-150	310	170	273	99	72
	313	165	344	39	56
	316	189	32	139	100
	318	129	78	13	0
		Subtotal	727	290	228
151-200	705	195	144	138	109
	706	476	635	238	237
	707	74	60	11	2
		Subtotal	839	387	348
201-300	708	126	9	2	13
	712	731	3	44	0
	713	851	161	65	34
		Subtotal	173	111	47
	Total [1]		9,204	28,680	32,741

[1] Totals are for all strata fished. Individual strata totals rounded to nearest 1000.

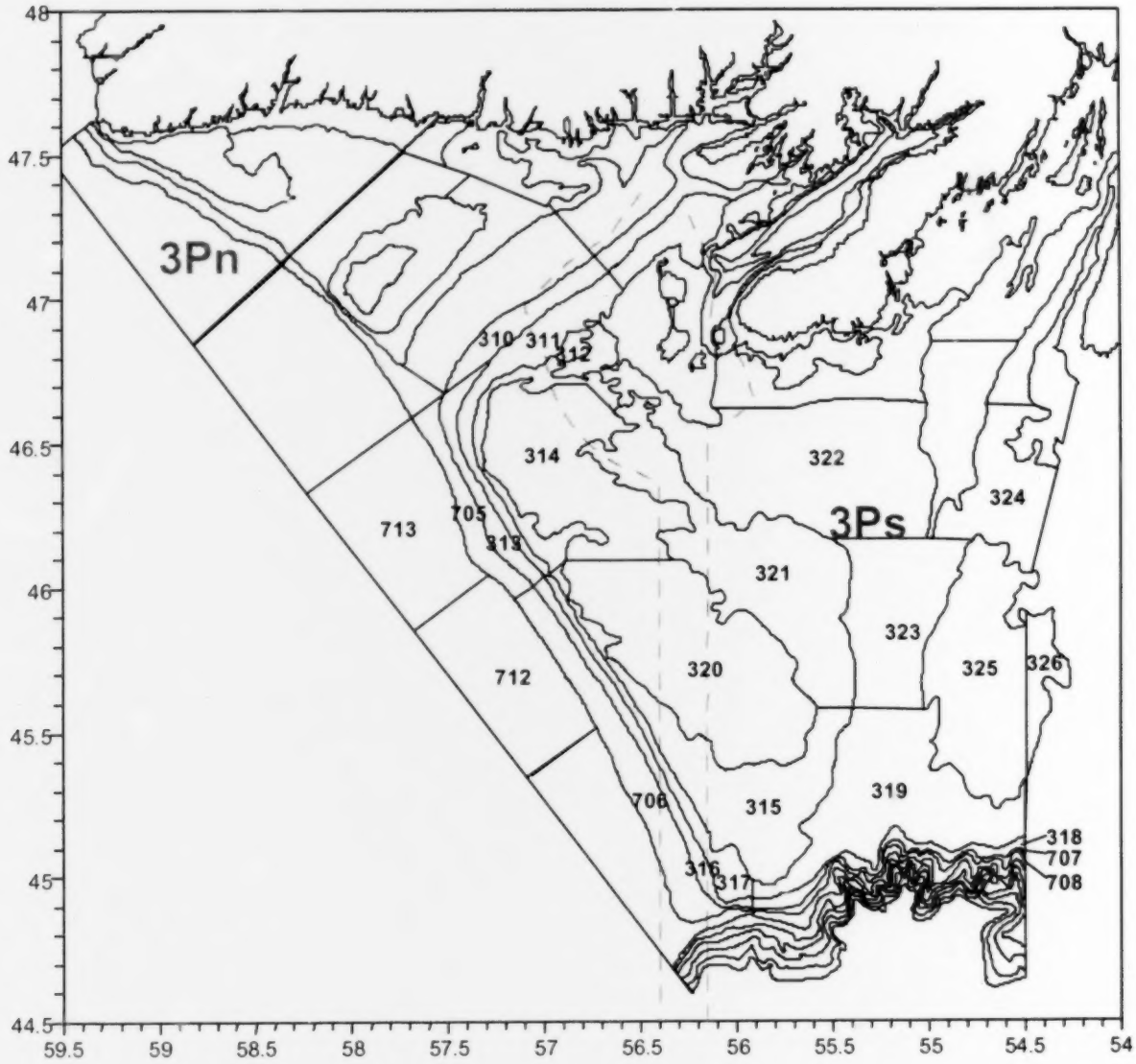

Figure 1 Stratum boundaries within NAFO Division 3P.
Numbered strata indicate those surveyed during fall GEAC bottom trawl survey of Subdivision 3Ps.
Dashed line is boundary of French economic zone which was not surveyed.

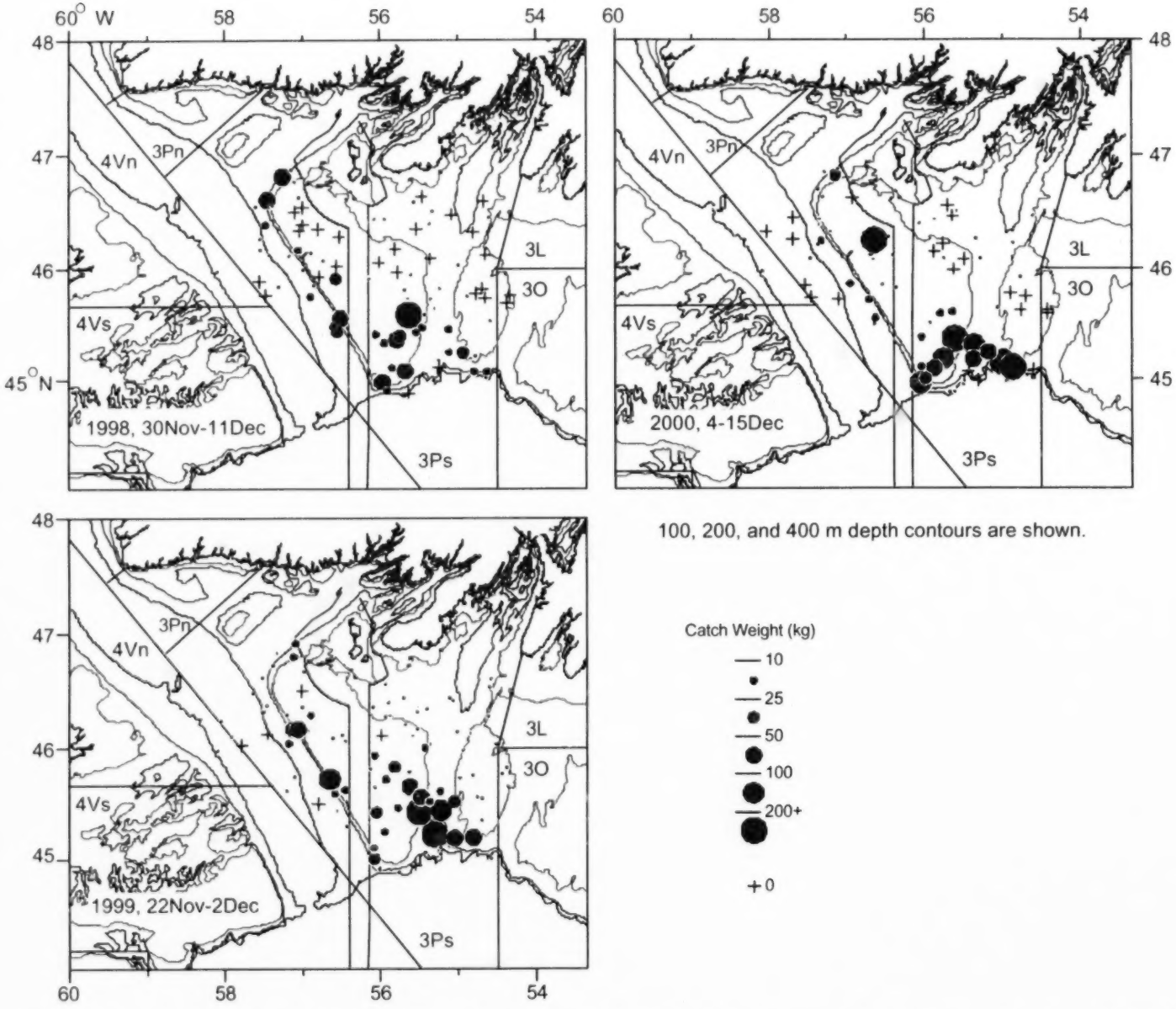

Figure 2 American Plaice Catch Weight Distribution from GEAC Stratified Random Surveys, 3Ps, 1998-2000.

Figure 3 2000 3Ps Survey Net Parameters
Mean values D=72.0, O=5.4, C=0.6

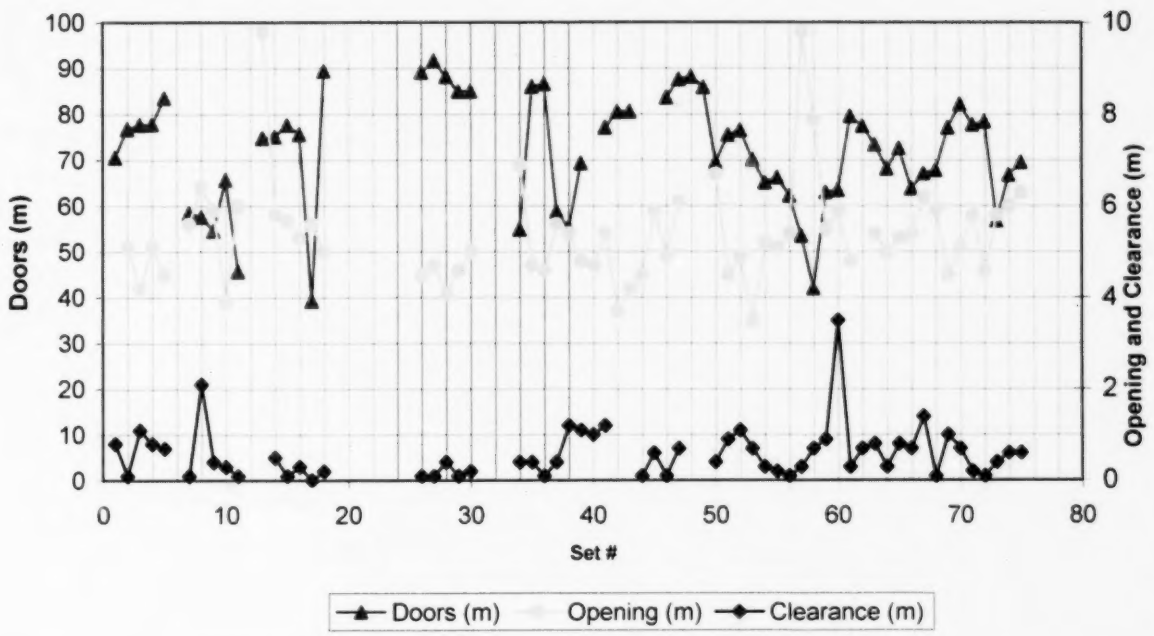

Figure 4 Length Composition of Plaice
(3Ps Stratified Random Surveys 1998-2000)

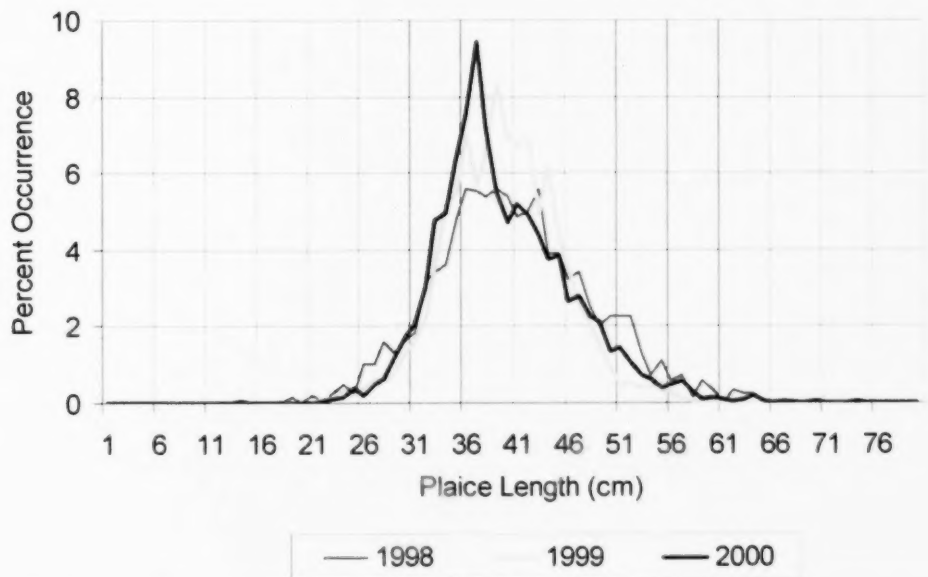

Figure 5a Plaice Age-LengthComposition
3Ps 2000 (521 samples)

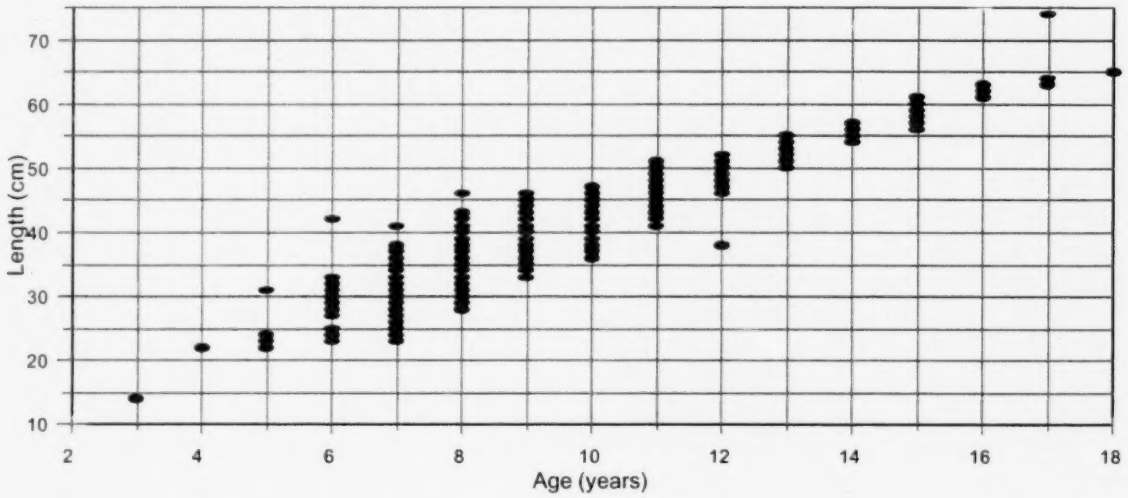

Figure 5b Age Composition of Plaice
3Ps Sampled Plaice

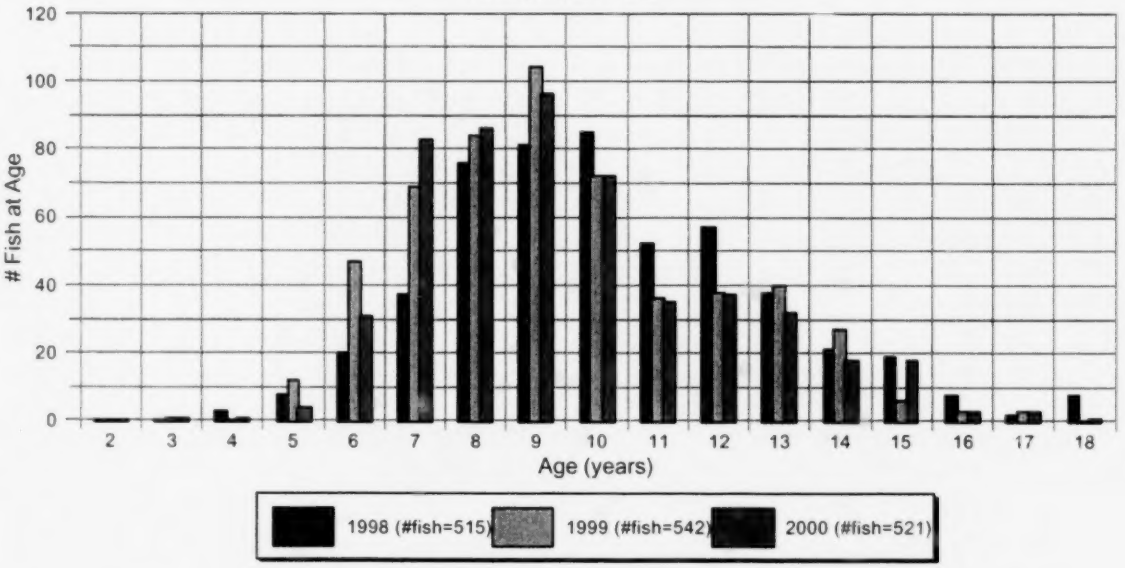

Figure 6 Age Composition of Plaice
Estimated Mean #s per tow (3Ps)

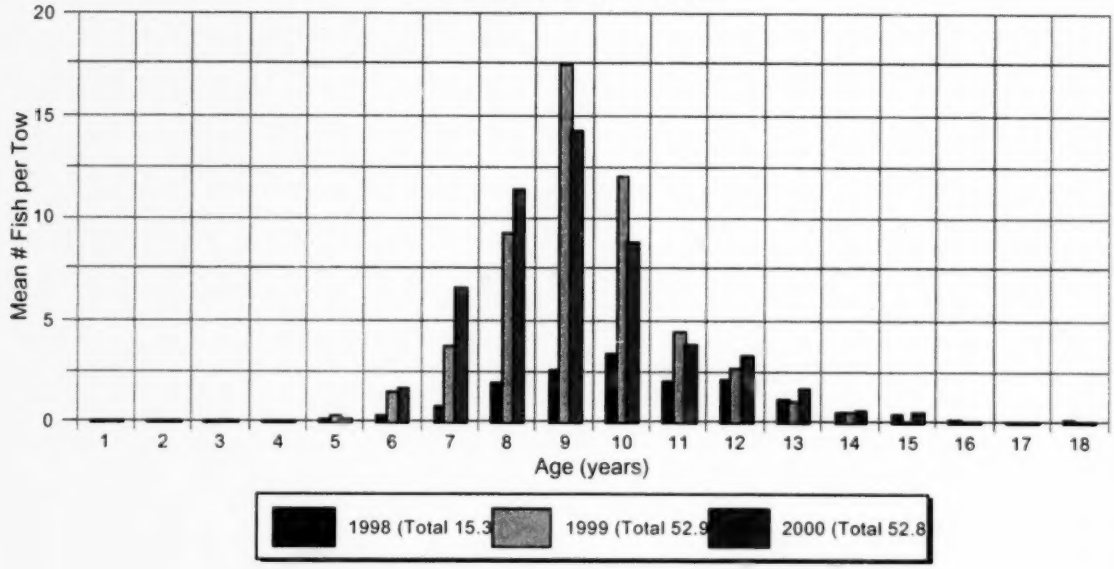

Figure 7 Year Class Composition
3Ps Plaice Estimated Mean #s per tow

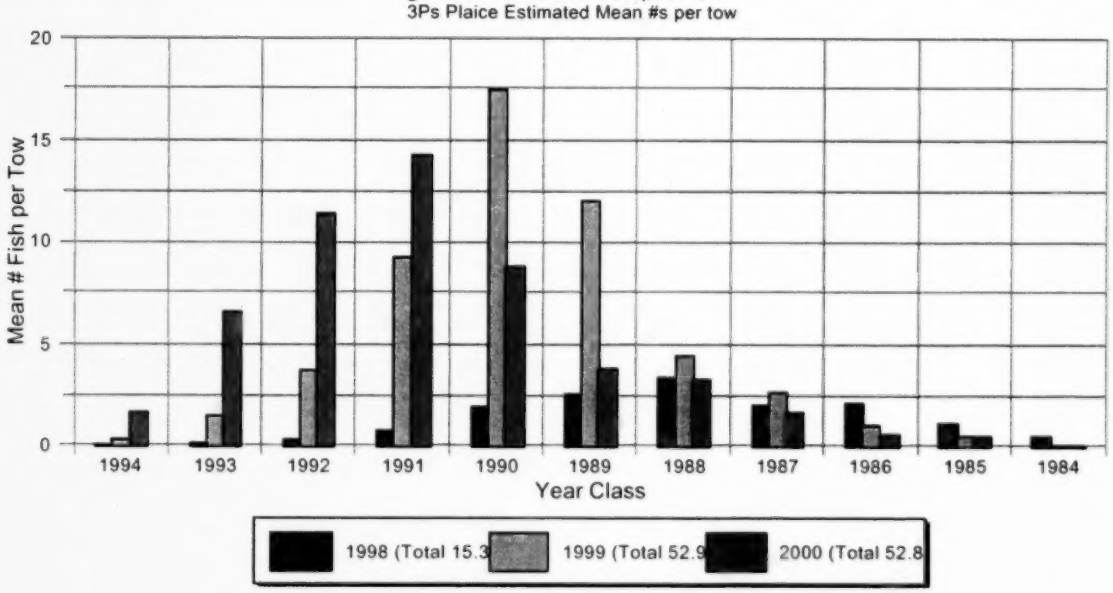

Figure 8 Plaice Survey Abundance index at length, 3Ps, 1998-2000